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COURSE BROCHURE

# Advanced Process Troubleshooting and Problem Solving Training Course

5 – 16 September 2027
Doha

# Advanced Process Troubleshooting and Problem Solving Training Course

**Ref:** 175_5102 **Date:** 5 – 16 September 2027 **Location:** Doha **Fees:** 11700 GBP

Advanced Process Troubleshooting and Problem Solving is a 2-week training course for process engineers, operations supervisors and technical support engineers who are called when a unit misbehaves, and it ends with a plant troubleshooting case file holding root cause evidence and verified corrective actions. Repeat upsets drain production and credibility far more than single failures. Jupiter Prime Training offers this course to operating and technical support groups.

## Why Process Troubleshooting and Problem Solving Matters Now

Three shifts raise the stakes. Plants hold years of historian data, yet many investigations still rely on memory and the loudest opinion. Experienced troubleshooters are retiring faster than their reasoning habits are passed on. Insurers, owners and safety teams also expect incident causes to be proven, not assumed. Sites that jump to the first plausible cause replace parts that were never faulty and see the same trip again; sites that test hypotheses close problems for good. The course rests on root cause analysis RCA, fault tree analysis FTA, why-why analysis and the plan-do-check-act PDCA cycle for verifying fixes.

## Who Gains Most from Process Troubleshooting and Problem Solving

- Engineers who lead the technical response to off-spec product or lost throughput
- Supervisors who decide on shift whether to adjust, slow down or shut down
- Support engineers who investigate trips, leaks and repeat equipment failures
- Specialists who read historian trends and laboratory results to locate faults
- Leads who track corrective actions until their effect is proven

An operations and technical support pairing that attends together gains most, because shift observations and engineering analysis then meet in one investigation.

## Process Troubleshooting and Problem Solving Capabilities

Participants leave able to move from symptom to proven cause without guessing, and to show the evidence for each step.

- Apply a structured problem statement and boundary — investigation sponsors setting scope
- Build fault trees and why-why chains from plant evidence — decisions on which causes to test
- Test hypotheses with trends, field checks and calculations — engineers avoiding false fixes
- Assess column, exchanger, pump and reactor symptoms against known failure signatures — operations leads
- Design corrective actions with clear verification criteria — maintenance and process owners
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Communicate findings as an evidence-based case file — plant management and safety reviewers

## Key Process Troubleshooting and Problem Solving Terms

- Root cause — the deepest controllable cause which, once removed, prevents the problem from recurring.
- Fault tree — a top-down diagram linking an undesired event to the combinations of failures that can produce it.
- Hypothesis testing — checking a suspected cause against data that would prove or disprove it before acting.
- Failure signature — the pattern of symptoms, trends and measurements that typically accompanies a given equipment fault.
- Contributing factor — a condition that made a problem more likely or worse without being its root cause.
- Corrective action verification — evidence collected after a fix showing the problem has stopped recurring.

## Process Troubleshooting and Problem Solving Day by Day

### Day 1: Troubleshooting Mindset and Investigation Scope

- Problem Statement and Deviation Definition — What Changed, Where and When
- Cognitive Traps in Plant Investigations — Anchoring, Confirmation and Haste
- Severity and Urgency Screening — Choosing Quick Containment or Full Investigation
- Investigation Charter and Roles — Who Gathers, Who Decides
- Evidence Preservation After an Upset — Samples, Logs and Witness Notes

### Day 2: Structured Root Cause Methods

- Why-Why Analysis with Evidence Gates — Stopping at Proven Causes
- Fault Tree Construction and Logic Gates — Mapping Failure Combinations
- Cause and Effect Diagrams — Organising Shift Team Observations
- Is and Is Not Comparison — Narrowing Causes by Contrast
- Change Analysis and Timeline Reconstruction — Linking Events to Onset

### Day 3: Process Data Trending and Diagnostics

- Historian Trend Selection and Time Alignment — Seeing Cause Before Effect
- Material and Heat Balance Checks — Spotting Impossible Readings
- Instrument Validation Before Diagnosis — Ruling Out Faulty Measurements
- Laboratory Data and Sample Integrity — Trusting Quality Results
- Statistical Shift Detection — Separating Real Change from Noise

## Day 4: Distillation Column Troubleshooting

- Flooding, Weeping and Entrainment Signatures — Reading Pressure Drop Trends
- Reboiler and Condenser Limitations — Heat Input and Reflux Symptoms
- Tray Damage and Fouling Evidence — Scan Results and Separation Loss
- Foaming and Contamination Episodes — Antifoam and Feed Quality Decisions
- Column Pressure Control Problems — Inerts and Vent Behaviour

## Day 5: Heat Exchanger and Furnace Problems

- Fouling Rate Tracking and Cleaning Triggers — Duty Loss Over Time
- Tube Leak Detection Methods — Pressure Tests and Composition Clues
- Vapour Binding and Condensate Backup — Hidden Exchanger Limits
- Furnace Draft and Flame Pattern Faults — Tube Overheating Warnings
- Bypass and Maldistribution Symptoms — Uneven Temperature Profiles

## Day 6: Pumps, Compressors and Fluid Handling

- Cavitation and Low Flow Symptoms — Noise, Vibration and Head Loss
- Seal and Bearing Failure Patterns — Process Causes Behind Mechanical Damage
- Compressor Surge Events and Trip Analysis — Recycle and Load Changes
- Two-Phase Flow and Slugging — Line and Separator Upsets
- Hydraulic Restriction Hunting — Strainers, Valves and Partial Blockages

## Day 7: Reactor and Catalyst Troubleshooting

- Conversion and Selectivity Drift — Feed, Temperature or Catalyst Causes
- Hot Spots and Temperature Runaways — Early Signs and Safe Responses
- Catalyst Deactivation Modes — Poisoning, Sintering and Coking Evidence
- Pressure Drop Rise Across Beds — Fines, Fouling and Channelling
- Mixing and Residence Time Problems — Tracer Tests and Agitator Checks

## Day 8: Utilities, Start-Up and Transient Faults

- Steam, Cooling Water and Air System Upsets — Plant-Wide Knock-On Effects
- Start-Up and Shutdown Deviations — Procedure Gaps and Sequencing Errors
- Intermittent Faults and Data Capture — Catching Rare Events
- Control System and Interlock Trips — Spurious Versus Genuine Causes
- Human and Procedural Factors — Shift Handover and Instruction Clarity

## Day 9: Corrective Action and Verification

- Action Hierarchy from Elimination to Procedure — Choosing Durable Fixes
- Corrective Action Tracking Register — Owners, Due Dates and Status
- Verification Criteria and Monitoring Period — Proving the Problem Has Stopped
- Management of Change for Fixes — Avoiding New Hazards from Solutions
- Lessons Learned Sharing — Preventing Repeats on Sister Units

## Day 10: Practising the Plant Troubleshooting Case File

- Case Problem Statement and Timeline — Agreed Starting Facts
- Fault Tree and Hypothesis Test Record — Causes Proven or Rejected
- Equipment Signature Evidence — Trends, Inspections and Calculations Combined
- Corrective Action Plan with Verification Criteria — Durable Fix Selection
- Plant Troubleshooting Case File — Root Cause Evidence and Verified Actions

## Applying Process Troubleshooting and Problem Solving After the Course

- Reopen one recurring upset on a unit and rebuild its fault tree, testing each branch against historian data.
- Set up a corrective action tracking register with verification criteria for the open actions in a department.

## Process Troubleshooting and Problem Solving Questions FAQ

### What is process troubleshooting and problem solving, and why does it matter now?

Process troubleshooting and problem solving is the structured search for the proven cause of a plant upset, followed by a verified fix. It matters now because data is plentiful but experienced troubleshooters are scarce, so repeat failures persist without a method.

### Which roles gain most from advanced process troubleshooting and problem solving training?

Process engineers, operations supervisors and technical support engineers gain most. They lead the response to upsets, read the trends and decide which actions to take and how to prove those actions worked.

### How does advanced process troubleshooting and problem solving differ from a general root cause analysis course?

It applies root cause methods to real process equipment. Beyond generic tools, participants learn the failure signatures of columns, exchangers, pumps and reactors and test hypotheses with plant data before any fix is chosen.

### What do you bring back from process troubleshooting and problem solving training?

You bring back a completed case file on a problem from your own plant. It contains the problem statement, timeline, fault tree, tested hypotheses, equipment evidence and a corrective action plan with criteria for proving success.

## Process Troubleshooting and Problem Solving: The Way Forward

The plant troubleshooting case file first informs whether a recurring upset needs a hardware change, a procedure change or a control fix. Operations supervisors and support engineers use it to agree actions and owners. After its first use, revisit the verification criteria, because a fix that holds for weeks may still fail under different feed or ambient conditions.